CINCAD SPACE SHUTTLE SUPPORT

AFTER-ACTION REPORT

ORBITAL FLIGHT TEST - 1

MAY 1981

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Space Operations Directorate
Cheyenne Mountain Complex, CO

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ABSTRACT

This report documents the internal deficiencies encountered in providing ADCOM support to NASA for the first Orbital Flight Test. Areas covered include training, exercises, software support, sensor support, comm support, future support responsibilities, and negotiations for OFT-2 support. Specific actions with suggested OPRs are provided as an aid in providing support for future Shuttle flights. The report concludes that the ADCOM support provided for OFT-1 met or exceeded NASA requirements.

INTRODUCTION

BACKGROUND

1. In December 1980, ADCOM/J-5 completed negotiations with NASA to provide support for the first flight of the Space Transportation System, Orbital Flight Test-1 (OFT-1). A formal requirements letter was signed and at that time responsibility for supporting OFT-1 was passed to ADCOM/J-3. ADCOM/J-3X was responsible for publishing a CINCAD OPLAN 90 days prior to the first flight and ADCOM/J-3Y was responsible for providing support to include publication of a detailed CINCAD Implementation Plan prior to the first flight.

PURPOSE

2. The purpose of this report is to formally document the ADCOM support provided for OFT-1 and to identify actions required prior to the next flight, OFT-2.

DESCRIPTION

3. ADCOM support to OFT-1 is described in general terms in CINCAD Space Shuttle Support OPLAN 3410-81, Mar 1981 (OPLAN). A detailed description of ADCOM support to include specific crew actions is contained in CINCAD Space Shuttle Support Implementation Plan 3410-81, Feb 1981 (IPLAN).

SCOPE

4. The scope of this report covers the initial negotiations of the requirements with NASA, the publication of the OPLAN and the IPLAN, the support provided during OFT-1 from 12 to 14 Apr 81, and the subsequent support provided for the post-flight analysis.

RESULTS AND DISCUSSION

GENERAL

5. The development and execution of ADCON support for OFT-1 was an evolutionary and learning process which will be discussed in detail in the following sections. It is important to remember that the primary purpose of this report is to identify actions and procedures to be taken to prepare for OFT-2, not, through hindsight, to identify shortcomings in the development of the support provided for OFT-1. The fundamental concept of operations was to use operational SPADOC crews to provide support to NASA rather than using a "tiger team" concept. Without exception, from NASA's viewpoint, the ADCON support provided throughout the 54½ hour flight of the Columbia by the SPADOC crews was flawless.

OPERATIONS PLAN (OPLAN)

6. The support required for OFT-1 consisted of providing timely Computation of Miss Between Orbits (COMBO), Tracking and Impact Prediction (TIP) of the External Tank (ET) and the Orbiter Vehicle (OV), and backup Early Orbit Determination (EODET). The OPLAN was satisfactory in describing these actions and assigning responsibilities to insure proper preparation to provide this support. Since the mission profile for OFT-2 will be very similar to that of OFT-1, no changes to the OPLAN are anticipated. There was, however, difficulty encountered in the timely publication of the OPLAN. (The OPLAN was distributed approximately one week prior to OFT-1.) Recommend that any future changes to the OPLAN be published and distributed as soon as possible prior to the affected flight.

IMPLEMENTATION PLAN (IPLAN)

7. The IPLAN was published and distributed approximately 60 days prior to OFT-1. It contained a detailed chronological sequence of events and crew actions, a list of responsibilities by agency and crew position, and a series of contingency checklists. The format of the IPLAN was satisfactory and should be followed for future flights. A new IPLAN should be published following a similar format as soon as the mission profile for OFT-2 is firm and the OFT-2 requirements have been negotiated. This plan should then be distributed to appropriate agencies within ADCOM, to all sensors involved, to HQ SAC, to DDMS, to NASA Centers, and one copy to each SPADOC crew member. Since this plan affects only ADCOM support, it is necessary to coordinate the plan with agencies only within ADCOM. Specifically, the IPLAN should be written by J-3Y, coordinated with J-5D, J-5C, J-5Y, J-36, J-3F, J-3Z, J-3X, J-3J, J-3T, J-3V and J-31A through E, and approved by J-31 for publication. A separate IPLAN will be published for each of the Orbital Flight Tests (OFT-1 through OFT-5) and then a generic form of this plan will be published as an annex to the OPLAN. For subsequent operational flights of the Space Transportation System (STS), this generic implementation plan will serve as a guide to ADCOM crews.

TRAINING

8. Prior to OFT-1 all crews participated in ADCOM simulated OFT-1 mission exercises. There were two OFT-1 mission scenarios developed. First, a normal mission with no contingencies and, second, a scenario with an ET overspeed contingency. Each crew participated at least once in each scenario. Additionally, ADCOM was a scripted player in

two NASA-directed full-mission simulations. Prior to OFT-1 all crews were evaluated and certified operationally ready. Four main areas need to be emphasized in future crew training in preparation for OFT-2

a. First, additional training is necessary in receiving data from the Johnson Space Center (JSC).

. It was very apparent during OFT-1 that one crew had practiced this procedure extensively and was well prepared. Other crews, however, had difficulty receiving and manipulating these data.

b. Second, crews need practice in communicating with NASA both over the voice line and the Data Speed 40 Teletype. Extensive practice using these systems should be incorporated in crew training immediately.

c. Third, some crew members had only a cursory knowledge of the actions required by the IPLAN. It appeared that individual crew knowledge of the OFT-1 profile and required SCC actions was a function of the leadership provided by the Space Surveillance Controller, rather than by any standards established by J-3T and J-3V. For future Shuttle support, it is vital that J-3T, J-3V, and the Command Directors set high standards of performance and insist that the crews meet those standards.

d. Finally, it would be helpful if all crew members were given a briefing of the total support provided to NASA by all agencies. This briefing would explain the role and scope of NASA sensors, ARIS

support, DDMS support, ESMC support, and ADCOM support. Recommend J-3T develop an overview Shuttle support briefing and include it in all training for MW, CP, and SPADOC crew personnel.

It is important for future Shuttle flights that personnel from J-3Y, J-3T, and J-3V work closely together to insure that the crews are trained and evaluated on the most current shuttle mission profile with the most current procedures.

EXERCISES

9. After the crew training program has been updated with the recommendations suggested in paragraph 8 above, shuttle support activities should be included in routine in-house exercises within the CP, SPADOG, MWC, and the SCC. These exercises should be conducted at least once a week. In addition, ADCOM should be a player in as many NASA mission exercises as possible.

CREW SUPPORT

10. The results of ADCOM support to OFT-1 validates the concept to use unaugmented crews to support shuttle operations. Although there were times during the 54½ hour flight when day-staff personnel provided guidance, it was clear that the operational crews are capable of providing the necessary support. Additional training is necessary (para 8) and changes must be made to the 427M software (para 11), but there will be no reason to augment the crews as Shuttle flights become more routine. For the Orbital Flight Test phase (OFT-1 through OFT-5), however, it is advisable to augment the SPADOC crews with qualified personnel from J-3Y during critical phases of each OFT flight. Once this phase is completed and a generic implementation

plan is added to the OPLAN (para 7), then augmentees should no longer be necessary. Development of separate crew checklists to support Shuttle flights is not recommended at this time. For the next four flights, the IPLAN will serve as a guide to crews of the sequence of events and any contingency actions. Actions listed in the IPLAN are already established as routine procedures for the crew.

SOFTWARE SUPPORT

11. Several software deficiencies were noted prior to and during OFT-1. These deficiencies were overcome by workarounds but resulted in unnecessary delays in processing data and a high-level of operator frustration. It became apparent during OFT-1 that ADCOM would experience difficulty in processing data and providing contingency support to any quick-reaction NASA requirements during a Shuttle anomaly. Nine PMRs and two DRs have been submitted to correct these deficiencies (see Atch A). It is imperative that these PMRs and DRs are completed prior to OFT-2.

SENSOR SUPPORT

12. Support by the SPADATS sensors during OFT-1 was commendable. Sixteen element sets were published from SPADATS observations. Two problems, however, were identified during the flight. First, obs from NAVSPASUR for the OFT-1 (object 12399) were not processed by the 427M system. Second, although sensors were tasked to obtain only three data points on each pass, this tasking was exceeded frequently. Since NASA was concerned with potential electromagnetic interference (EMI) from SPADATS sensors, this additional tracking is of concern. J-3Z is currently working both these problems (see Atch B). These problems should be corrected prior to OFT-2.

ASCC AND BCF SUPPORT

13. Support provided by the Alternate Space Computation Center (ASCC) at Eglin AFB and the NAVSPASUR Backup Computation Facility (BCF) at Dahlgren, VA, consisted of running in parallel operations throughout the duration of OPT-1. Both facilities provided shadow COMBO and TIP support throughout OPT-1 and forwarded the outputs from these programs to the SCC. The BCF provided primary computational backup support and the ASCC provided primary command and control backup support. For OPT-1, the SCC remained fully operational and no backup support was required. No problems were encountered in the implementation of parallel operations with the ASCC and the BCF. A complete analysis of the COMBO and TIP support provided by the ASCC and the BCF is currently being conducted by J-36. A separate formal report documenting these results will be published by J-36 by 15 Jun 81.

SATELLITE EARLY WARNING SYSTEM (SEWS) SUPPORT

14.

Military Uses of Space: 1946-1991

Published by:
Chadwyck-Healey Inc., 1101 King Street, Alexandria, Virginia 22314

Military Uses of Space: 1946-1991 provides a detailed record of the strategic importance of the U.S. military space program from the conceptualization of the uses of space to the present realization of advanced capabilities. Materials were identified, obtained, assembled, and indexed by the National Security Archive, a non-profit, Washington, D.C. based research institute and library. The microfiche collection is accompanied by Military Uses of Space: 1946-1991 Guide and Index.

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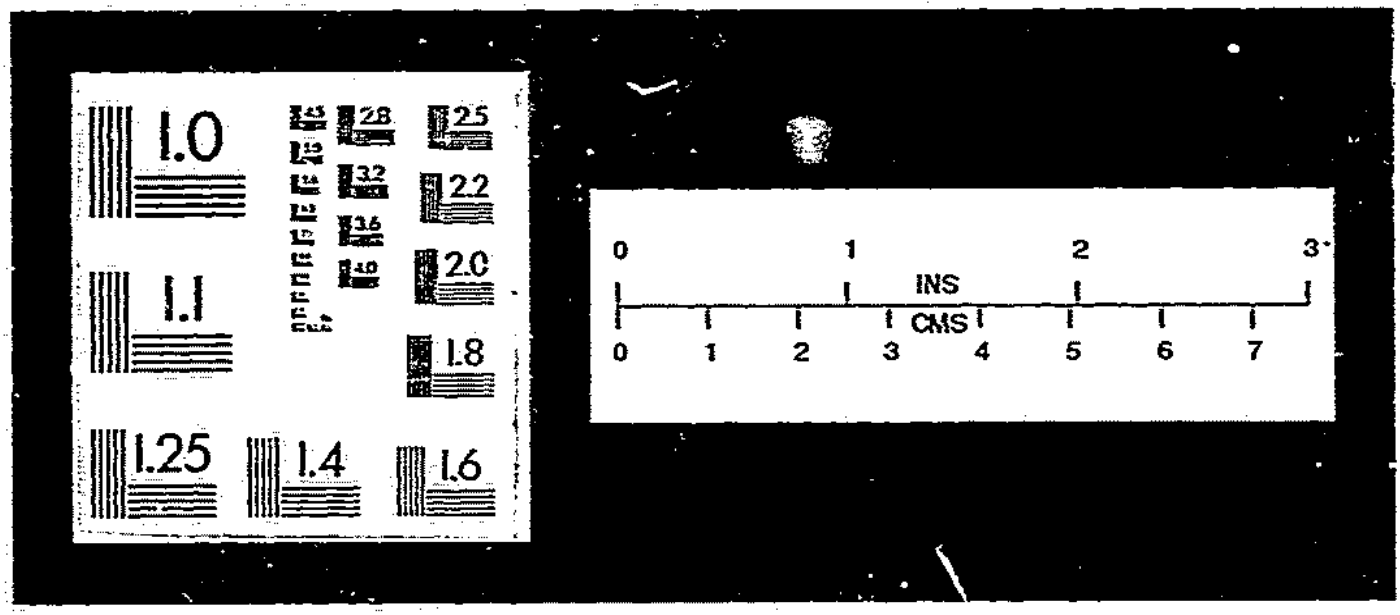

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b5

COMMUNICATIONS SUPPORT

15. Communications support consisted of the following circuits between the SCC and JSC: b5 !

The voice circuit was designed to have a monitor capability of the NASA Flight Director, Cap Comm, and Flight Dynamics loops; however, this feature did not work. A squawk box was installed over the Orbital Analyst Leader's console so that SCC personnel could monitor the voice circuit. The primary problem with the shout down circuit was the lack of reliable response: it was easy for the NASA crew personnel to turn down the volume during peak periods and then subsequently forget to turn it back up. This action rendered the circuit effectively inoperative from the SCC end. In addition, NASA personnel were unfamiliar with the b5 and frequently were unable to transmit over this circuit. For future flights, J-3Y has requested the following changes to the current comm support:

a. Change the shout down voice circuit to a ring down circuit keeping the SCC squawk box.

b. Add the JSC ring down circuit to the SST and SOT consoles in the SCC (keep the current connections to the OAL, SSC, and SVO consoles).

c. Install a separate, dedicated, monitor-only telephone

circuit with speaker to the Flight Director, Cap Comm, Flight Dynamics and Comm/Nav consoles at JSC.

SCC CROWD CONTROL

16. Just prior to launch, the SCC door lock combination was changed and a notice was posted limiting access to personnel directly involved with Shuttle support. Since the launch occurred on a weekend, crowd control was not a problem until the reentry on 14 April. The difficulty was that there was no accessible television monitor available to watch the coverage of the reentry other than in the SCC. Supervisors were reluctant to turn people away from this historic event, even though the SCC became a little overcrowded. For future flights, recommend that TV monitors be made available in the dining hall or some other accessible location within the MCMC.

MISSILE WARNING SUPPORT

17. The Missile Warning crew provided the communications link between the SCC and the SPMS sites. This arrangement was satisfactory and should continue for future flights. The reentry of the Orbiter Vehicle generated the appropriate response from the Missile Warning network and was handled according to routine procedures. No changes to these procedures are required for subsequent Shuttle flights.

RADAR RESTRICTIONS

18. Shortly prior to the OFT-1 flight, NASA imposed the following radar restrictions:

a. No tracking with the Eglin phased-array radar during launch or reentry.

b. No tracking with b5 , Kwajalein, Millstone or Haystack radars.

c. No dual-face tracking with the PAVE PAWS phased-array radars.

Since the launch and reentry were not in Eglin's coverage and the software in PAVE PAWS precludes dual-face tracking, the only impact of this restriction was to limit b5 from providing ZODET and normal SPADATS tracking (Kwajalein, Millstone and Haystack are not normally used in the SPADATS network). The Orbiter was catalogued as SCC Object 12399 and 16 elements were published. There were no problems encountered in maintaining the Orbiter through sole use of SCC observations. The actual validity and impact of the NASA-imposed radar restriction is currently being worked by J-3Z (see Atch 5).

DATA FLOW BETWEEN SCC AND JSC

19. With the use of the AUTODIN circuit, data such as COMBO results, were passed directly to JSC through messages generated by the 427M system. On the other hand, data (primarily inter-range vectors) passed from JSC to the SCC were passed by voice and then manually entered into the 427M system. This form of data transmission is slow, awkward, and error-prone. NASA rejected the idea of passing data via the b5 because it would entail at least two manual operations and physically running the data to another, distant location. Attempts should be made with NASA to automate the transmission of this data computer-to-computer via AUTODIN. Considering the number of planned STS flights, this is the only practical long

term solution to the problem. For OFT-2, every effort should be made to expedite the flow of data from JSC to the SCC.

CONTINGENCY SUPPORT

20. The only contingency that arose during OFT-1 was not covered in the IPLAN; however, crew response was satisfactory. NASA, through OSD, requested special optical support by Air Force sensors. An overseas sensor was recalled by the SCC to provide this support. Eglin was tasked to obtain at least 12 obs on the next OV pass to insure that an accurate element set was passed to the appropriate sensors. This contingency was handled very well by the SCC crew and one day-staff augmentee. It could have been also accomplished by the SCC crew alone.

FUTURE SUPPORT RESPONSIBILITIES

21. One of the problems encountered in providing support to NASA for OFT-1 was a fragmentation and a lack of definition of responsibilities during the initial phases of developing this support. The result was frequent and duplicating communications with NASA officials and other agencies. To correct this problem, J-3Y, J-3Z and J-5D have agreed to the following division of responsibilities for OFT-2:

a. J-5D will be the primary OPR for OFT-2 until completion of the required planning actions. As such, J-5D will set up the necessary meetings with JSC to negotiate the requirements for OFT-2. Representatives from J-3Z and J-3Y will attend this meeting. After completion of the required planning actions J-5D will be kept tightly in the loop during all phases of ADCOM support for OFT-2 to ensure J-5 continuity throughout the STS program.

b. J-3Y will become primary OPR upon completion of required planning actions and formal transfer of responsibility from J-5 to J-3. J-3Y will publish a new IPLAN, chair an OFT-2 Support Working Group, and be responsible for all direct communications and interfaces with NASA and PTD.

c. J-3Z will be responsible for all communications and interfaces with the sensors, the ASCC, the SCF, DDMS, and ESMC at Patrick AFB.

NEGOTIATIONS FOR OFT-2 SUPPORT

22. During the negotiations with JSC for ADCOM support for OFT-2, particular attention should be given to the following areas:

a. A specific, validated need for imposed radar restrictions should be discussed and resolved as soon as possible. There is evidence that the initial restriction for OFT-1 was too conservative. J-3Z is currently working this problem.

b. All negotiated support requirements should be validated against the actual mission profile. (For OFT-1, it was questionable if EODET support could have been provided prior to NASA rev 2, even if Diyarbakir had been allowed to track.)

c. Negotiations should include discussions of speeding the data flow from JSC to the SCC, improving the voice comm circuits, and requirements for post-mission analysis (specifically, requirements to analyze the ET reentry).

CONCLUSIONS

23. ADCOM support provided to JSC for OFT-1 met or exceeded all the requirements requested by NASA. The concept of providing the support as a routine crew function was validated. Support for the remaining Orbital Flight Tests (OFT-2 through OFT-5) should follow the same scenario as that provided for OFT-1.

RECOMMENDATIONS/ACTIONS

24. The following summary of recommendations and actions is provided to aid in preparation for OFT-2. Suggested OPRs are added to facilitate completion of the actions. Paragraph references are made to body of the report for a more detailed discussion. Recommendations are made sequentially as they appear in the report, rather than by priority.

a. Changes to OPLAN should be timely (para 6): J-3X.

b. Format of IPLAN should be kept (para 7): J-3Y.

c. New IPLAN should be published for each Orbital Flight Test (para 7): J-3Y.

d. Each IPLAN should be coordinated with agencies within ADCOM (para 7): J-3Y.

e. A generic IPLAN should be incorporated as annex to OPLAN for flights subsequent to OFT-5 (para 7): J-3Y, J-3X.

f. Additional training required in receiving realtime data from JSC (para 8a): J-3T.

g. Additional training required on voice procedures and use (para 8b): J-3T.

h. Crew members must be required to know material in IPLAN (para 8c): J-3T, J-3V, J-31A through E.

i. Overview Shuttle support briefing required (para 8d): J-3T.

j. In-house exercises of Shuttle support for CP, MM, SPADOC, and SCC crews necessary (para 9): J-3T.

k. ADCOM should play in all NASA mission exercises (para 9): J-3Y, J-3T.

l. SPADOC crews should be augmented for each flight through OFT-5 (para 10): J-3Y.

m. No crew augmentation required for operation Shuttle flights subsequent to OFT-5 (para 10): no action.

n. Development of separate crew checklists for Shuttle support not necessary at this time (para 10): no action.

o. Software modifications identified in Atch A should be modified prior to OFT-2 (para 11): J-3Y, J-3P, J-6S.

p. Sensor problems of exceeding tasking must be corrected (para 12): J-3X.

q. Problem of non-processing of NAVSPASUR obs for OFT-1 must be corrected (para 12): J-3X.

r. A complete analysis of COMBO and TIP programs of the SCC, the ASCC and the BCP should be completed and documented (para 13): J-36.

s. SSMS special support capability should be upgraded (para 14): J-3FD.

t. Change shout down circuit to ring down circuit (para 15a): J-3Y, J-6CT.

u. Add the JSC ring down circuit to SST and SOT consoles (para 15b): J-3Y, J-6CT.

v. Install separate monitor circuit (para 15c): J-3Y, J-6CT.

w. Make TV monitors available to MCMC personnel during Shuttle operations (para 16): J-3Y.

x. No changes to MW procedures necessary for Shuttle operations (para 17): no action.

y. Resolve the NASA-imposed radar restrictions prior to OFT-2 (para 18c and para 22a): J-32.

s. Expedite the flow of data from JSC to the SCC (para 19): J-3Y.

aa. J-3Y is primary OPR for OFT-2 (para 21a): J-3Y.

bb. J-3Y is responsible for all interface with NASA and PTD (para 21a): J-3Y.

cc. J-3X is responsible for all interface with sensors, ASCC, SCF, DOMS, and SAMC (para 21b): J-3X.

dd. J-5D will set up first meeting with JSC for OFT-2 (para 21c): J-5D.

ee. Validate all support requirements (para 22b): J-5D, J-3Y, J-3X.

ff. Include speeding data flow, improving comm, and specific post-mission analysis in initial negotiations for OFT-2 support (para 22c): J-5D, J-3Y, J-3X.

ATTACHMENT A

REQUIRED SOFTWARE MODIFICATIONS

PROGRAM MODIFICATION REQUEST (PMR)

8 May 1981 | 2

4. Originator (Name, telephone number, and organizational mailing address)
Lt Col Giffen, Robert B. DOY x3004
Lt Bowen, Douglas L. DOYY x3585

5. System Affected: SCC

6. Computer Program name: SP2GP

7. Modification Type (Check all applicable boxes)

Operational Capability	Interface
[X] Add [ ] Modify [ ] Delete	[ ] Hardware [ ] Other System

8. Cost Estimates: Man-Days | Dollars

9. Core Memory Requirement: Locations — Adds | Deletes

10. Other Memory (Specify): Locations — Adds | Deletes

If additional space is required for following items continue on separate sheet and prefix each continuation with appropriate item number.

11. Description of Current Procedure (Identify in detail the current procedure or program features to be changed.)

None.

12. Proposed Change (Identify the new or proposed procedure in as much detail as possible. Include all known areas of program or system affected.)

New program to convert osculating elements to mean elements. Contact ADC/DO6, Mr. Paul Major (ext. 6108) for the algorithms.

13. Justification (Include complete and detailed justification. Also include recommended programming agency.)

Required for Shuttle support.

427M DISCREPANCY REPORT (DR)

DISCREPANCY REPORT NUMBER

I. ORIGINATOR

NAME OF ORIGINATOR (Last, first, middle initial)	DUTY TELEPHONE	DATE
GIFFEN, R. B., Lt Col.	CMC 3585	8 May 81

NATURE OF DISCREPANCY

PREDICT IMPACT does not process sub-orbital vectors correctly. In processing a simulated vector from the external tank of the Space Shuttle, PREDICT IMPACT indicated the object would not decay within 30 days. Using other techniques were able to verify that the tank would decay in less than 15 minutes.

COMPLETE ALL APPLICABLE ITEMS

SYSTEM IDENTIFICATION NUMBER	RELEASE	NAME OF MODULE
SCC	E	TIPX

DOCUMENT	PAGE	PARAGRAPH

RESOLUTION DESIRED BY (Date): Required for Shuttle support.

ADDITIONAL DATA ATTACHED

ERROR
- CODING
- DOCUMENT
- INTERFACE
- OTHER

II. TEAM LEADER

NAME OF TEAM LEADER (Last, first, middle initial)	DUTY TELEPHONE	DATE
R. B. GIFFEN, Lt Col, USAF	CMC 3004	

INTERNAL RESOLUTION (See Section IV) | CCB RESOLUTION

COMPLETED NOT LATER THAN (Date)	RESOLUTION TASK ASSIGNED TO	RESOLUTION DESIRED BY (Date)

III. CCB CONTROL

DATE RECEIVED	DATE CLOSED	CCB PRIORITY	ASSIGNED TO

CCB ACTION

ATTACHED BY

IV. RESOLUTIONS

TYPE (May be more than one)

- NO ERROR
- PROCEDURE ERROR
- NEW PROGRAM/PROGRAM MODIFICATION
- DOCUMENT MODIFICATION
- DESIGN MODIFICATION
- QUICK FIX OCTALS
- ALTER CARDS
- OTHER

ACTION TO BE TAKEN

CORRECTIVE ACTION ASSIGNED TO	DESIRED COMPLETION DATE

ADCOM FORM DEC 77 103

PROGRAM MODIFICATION REQUEST (PMR)	8 May 81	2	

4. Originator (Name, functional address symbol, and telephone number)	5. System Prefix	6. Computer Program Name
Lt Col Giffen, Robert B. DOY x3004 Lt Bowen, Douglan L. DOYY x3585	BCC	MANDC

7. Modification Type (Check all applicable items)		8. Cost Estimates		9. Core Memory Requirement		10. Other Changes (Specify)	
Operational Capability	Interface	Man-Days	Computer Hours	Locations		Locations	
				Added	Deleted	Added	Deleted
ADD (X) MODIFY DELETE	DATA BASE OTHER SYSTEM						

If additional space is required for following items, continue on reverse, and precede each continuation with appropriate item number.

11. DESCRIPTION OF CURRENT PROCEDURE (Identify in detail the current procedure or program features to be changed.)

MANDC aborts when you try to process a sub-orbital element set.

12. PROPOSED CHANGE (Identify the new or proposed procedure in as much detail as possible. Include all known areas of program or system affected.)

Modify MANDC to handle a sub-orbital element set and produce warning DAAAs on the non-routine cases:

13. JUSTIFICATION (Include complete and detailed justification. Also include estimated programming effort.)

Required for Space Shuttle support.

ADCOM Form 542 [illegible] OBSOLETE.

PROGRAM MODIFICATION REQUEST (PMR)	3. DATE: 8 May 1981	4. PRIORITY: 2	5. PMR LOG NO.

1. ORIGINATOR (Name, functional address symbol, and telephone number)	2. SYSTEM AFFECTED	6. COMPUTER AFFECTED (and type)
Lt Col Giffen, Robert B. DOY x3004 Lt Bowen, Douglas L. DOYY x3585	SCC	PLINT

7. MODIFICATION TYPE (Check all applicable boxes)		8. COST ESTIMATES		9. CORE MEMORY REQUIREMENT		10. STRUCTURE (Specify)	
OPERATIONAL CAPABILITY	INTERFACE	MAN-DAYS	COMPUTER HOURS	LOCATIONS: ADDS	DELETES	LOCATIONS: ADDS	DELETES
☐ ADD ☒ MODIFY ☐ DELETE	☐ HARDWARE ☐ OTHER SYSTEM						

If additional space is required for following items continue on reverse, and precede each continuation with appropriate item number.

11. DESCRIPTION OF CURRENT PROCEDURE (Identify or detail the current procedure or program features to be changed.)

FLINT aborts when you try to process a sub-orbital element set.

12. PROPOSED CHANGE (Identify the new or proposed procedure in as much detail as possible. Include all known areas of program or system affected.)

Modify FLINT to handle sub-orbital element sets and produce warning DAAAs for the non-routine cases.

13. JUSTIFICATION (Include complete and detailed justification. Also include recommended programming approach.)

Required for Shuttle support.

PROGRAM MODIFICATION REQUEST (PMR)	1. DATE	2. PRIORITY	3. FOR MONTH
	8 May 1981	2	

4. ORIGINATOR (Name, functional address symbol, and telephone number)	5. SYSTEM AFFECTED	6. COMPUTER PROGRAM NAME
Lt Col Giffen, Robert B. DOY x3004 Lt Bowen Douglas L. DOYY x3585	SCC	ASSOCX

7. MODIFICATION TYPE (Check all applicable items)		8. COST ESTIMATES		9. CORE MEMORY REQUIREMENT		10. TURNAROUND (Specify)	
OPERATIONAL CAPABILITY	INTERFACE	MAN-DAYS	COMPUTER HOURS	LOCATIONS		LOCATIONS	
				ADDED	DELETED	ADDED	DELETED
[ ] ADD [X] MODIFY [ ] DELETE	[ ] HARDWARE [ ] OTHER SYSTEM						

If additional space is required for following items continue on reverse, and prefix each continuation with appropriate item number.

11. DESCRIPTION OF CURRENT PROCEDURE (Identify in detail the current procedures or program features to be changed.)

ASSOCX will not do residual calculations on a sub-orbital element set.

12. PROPOSED CHANGE (Identify the new or proposed procedures in as much detail as possible. Include all known areas of program or system affected.)

Modify ASSOCX to process sub-orbital element sets and produce warning DAAAs for the non-routine cases.

13. JUSTIFICATION (Include complete and detailed justification. Also include recommended priority ranking.)

Required for Shuttle support.

(PMR)	8 May 81	2	

Originator	Subsystem	Computer program unit
Lt Col Giffen, Robert B. DOY x3004 Lt Bowen, Douglas L. DOYY x3585	SCC	TIPX

Modification type: Operational capability	Interface	Cost estimates	Core memory requirement	Other
ADD / X MODIFY / DELETE	HARDWARE / OTHER SYSTEM	MANDAYS / COMPUTER HOURS	LOCATIONS: ADDED / DELETED	LOCATIONS: ADDED / DELETED

11. DESCRIPTION OF CURRENT PROCEDURE

TIPX (PREDICT IMPACT) will not process $XXXX element sets.

12. PROPOSED CHANGE

Modify TIPX (PREDICT IMPACT) to process $XXXX element sets.

13. JUSTIFICATION

Required for Shuttle support.

ADCOM ... 542

427M DISCREPANCY REPORT (DR)

DISCREPANCY REPORT NUMBER

I. ORIGINATOR

NAME OF ORIGINATOR (Last, first, middle initial)	ORG & TELEPHONE	DATE
Lt Col Giffen, Robert B. Lt Bowen, Douglas L.	X3004 X3585	8 May 1981

NATURE OF DISCREPANCY

The mean motion conversion in GP2SP is not correct. Contact ADC/DO6, Mr. Paul Major (ext. 6108) for the correct algorithm.

COMPLETE ALL APPLICABLE ITEMS

SYSTEM IDENTIFICATION	RELEASE	NAME OF MODULE
SCC	E	GP2SP

NUMBER

DOCUMENT	PAGE	PARAGRAPH

RESOLUTION DESIRED BY (Date)
Required for Shuttle support.

ADDITIONAL DATA ATTACHED

ERROR
- DESIGN
- CODING
- DOCUMENT
- INTERFACE
- OTHER

II. TEAM LEADER

NAME OF TEAM LEADER (Last, first, middle initial)	DUTY TELEPHONE	DATE
Giffen, Robert B., Lt Col, USAF	CMC 3004	

INTERNAL RESOLUTION (See Section IV) — CCB RESOLUTION

COMPLETED NOT LATER THAN (Date)	RESOLUTION TASK ASSIGNED TO	RESOLUTION DESIRED BY (Date)

III. CCB CONTROL

DATE RECEIVED	DATE CLOSED	CCB PRIORITY	ASSIGNED TO

CCB ACTION

AUTHORIZED BY

IV. RESOLUTIONS

TYPE (May be more than one)

- NO ERROR
- PROCEDURE ERROR
- NEW PROGRAM/PROGRAM MODIFICATION
- DOCUMENT MODIFICATION
- DESIGN MODIFICATION
- PATCH FIP OCTALS
- ALTER CARDS
- OTHER

ACTION TO BE TAKEN

CORRECTIVE ACTION ASSIGNED TO	DESIRED COMPLETION DATE

ADCOM FORM DEC 77 103

(PMR)	24 Mar 81	3	

4. ORIGINATOR (Name, functional address, symbol, and telephone number)	5. SYSTEM TITLE	6. CONFIGURATION BASE
Paul Major DO6 6109 Lt Bowen, Douglas L DOYY 3585	SCC	IOMODX

7. MODIFICATION TYPE (Check all applicable items)		8. COST ESTIMATES		9. CORE MEMORY REQUIREMENT		10. ENVIRONMENT (Specify)	
OPERATIONAL APPLICATION	INTERFACE	MAN-DAYS	COMPUTER HOURS	LOCATIONS		LOCATIONS	
[ ] ADD [X] MODIFY [ ] DELETE	[ ] HARDWARE [ ] OTHER SYSTEM			ADDED	DELETED	ADDED	DELETED

If additional areas are required for following items continue on reverse, and provide each continuation with appropriate item number.

11. DESCRIPTION OF CURRENT PROCEDURE (Identify or detail the current procedure or program features to be changed)

IOMODX will generate a GE element set from obs typed in through the GDC.

12. PROPOSED CHANGE (Identify the new or proposed procedure in as much detail as possible. Include all known areas of program or system affected.)

Modify IOMODX to allow the DCO to enter at least 10 obs (including satellite number) and save these obs in ASSOCX format.

13. JUSTIFICATION (Include complete and detailed justification. Also include recommended programming approach.)

This capability is required for Shuttle support.

(Pink)	8 May 81	2,	

4. Name and address, functional address symbol, and telephone number Lt Col Giffen, Robert B. DOY x3004 Lt Bowen, Douglas L. DOYY x3585	5. System Affected SCC	6. Computer Program Name GP2SP

7. MODIFICATION TYPE (Check all applicable boxes)		8. COST ESTIMATES		9. CORE MEMORY REQUIREMENT		10. OTHER MEMORY (Specify)	
OPERATIONAL CAPABILITY	INTERFACE	MAN-DAYS	COMPUTER HOURS	LOCATIONS		LOCATIONS	
				ADDED	DELETED	ADDED	DELETED
☐ ADD ☒ MODIFY ☐ DELETE	☐ HARDWARE ☐ OTHER SYSTEM						

If additional space is required for following items continue on reverse, and [illegible] each continuation with appropriate item number.

11. DESCRIPTION OF CURRENT PROCEDURE (Identify by detail the current procedures or program features to be changed.)

GP2SP will not allow mean motions large enough to input suborbital vectors.

12. PROPOSED CHANGE (Identify the new or proposed procedures in as much detail as possible. Include all known areas of program or system affected.)

Modify GP2SP to process ALL input and produce warning DAAAs for such cases as negative perigees.

13. JUSTIFICATION (Include complete and detailed justification. Also include recommended programming agency.)

Required for Shuttle support.

ADCOM FORM SRC-76 542 REPLACES ADC FORM 542, OCT 69, WHICH IS OBSOLETE.

PROGRAM MODIFICATION REQUEST (PMR)	1. DATE: 8 May 1981	2. PRIORITY: 2	3. FOR DOCS:
4. ORIGINATOR (Name, functional symbol, and telephone number): Lt Col Giffen, Robert B. DOY x9004 Lt Bowen, Douglas L. DOYY x3585	5. SYSTEM: SCC	6. MODULE NAME or NUMBER: IOMODX	

7. MODIFICATION TYPE (Check all applicable boxes)		8. COST ESTIMATES		9. CORE MEMORY REQUIREMENT		10. STATEMENT/CARD (Specify)	
OPERATIONAL CAPABILITY	INTERFACE	MAN-DAYS	DOLLARS (000)	LOCATIONS		LOCATIONS	
[X] ADD [ ] MODIFY [ ] DELETE	[ ] HARDWARE [ ] OTHER SYSTEM			ADDS	DELETES	ADDS	DELETES

If additional space is required for following items continue on reverse, and prefix each continuation with appropriate item number.

11. DESCRIPTION OF CURRENT PROCEDURE (Identify or detail the current procedure or program features to be changed.)

IOMODX will process XYZs to generate an element set.

12. PROPOSED CHANGE (Identify the new or proposed procedures in as much detail as possible. Include all known areas of program or system affected.)

Add the capability to IOMODX to convert XYZs to TEAR data. We also need the capability to file-up these converted observations in an ASSOCX file (PMR already submitted).

13. JUSTIFICATION (Include complete and original justification. Also include recommended programming agency.)

Required for Shuttle support.

PROGRAM MODIFICATION REQUEST (PMR)	1. DATE: 8 May 1981	2. PRIORITY: 2	3. FOR AFSCF USE
4. ORIGINATOR (Name, functional address symbol, and telephone number): Lt Col Giffen, Robert B. DOY x3004 Lt Bowen, Douglas L. DOYY x3585	5. APPROVED BY: SCC	6. SUBSYSTEM OR PROGRAM NAME: TRAILX	

7. MODIFICATION TYPE (Check all applicable boxes)		8. COST ESTIMATES		9. CORE MEMORY REQUIREMENT		10. OTHER MEMORY (Specify)	
OPERATIONAL CAPABILITY	INTERFACE	MAN-HOURS	COMPUTER HOURS	LOCATIONS		LOCATIONS	
				ADDED	DELETED	ADDED	DELETED
[ ] ADD [X] MODIFY [ ] DELETE	[ ] HARDWARE [ ] OTHER SYSTEM						

If additional space is required for following items continue on reverse, and prefix each continuation with appropriate item number.

11. DESCRIPTION OF CURRENT PROCEDURE (Identify in detail the current procedure or program features to be changed.)

TRAILX aborts if you input a sub-orbital element set.

12. PROPOSED CHANGE (Identify the new or proposed procedure in as much detail as possible. Include all known areas of program or system affected.)

Modify TRAILX to process all element sets and produce warning DAAAs for the non-routine cases.

13. JUSTIFICATION (Include complete and detailed justification. Also include recommended programming priority.)

Required for Shuttle support.

ADCOM FORM NUC 74 342 REPLACES SCC FORM 342, OCT 81, WHICH IS OBSOLETE.

ATTACHMENT B

J-318 LETTER ON SENSOR

SUPPORT AND RADAR RESTRICTIONS

HEADQUARTERS
NORTH AMERICAN AIR DEFENSE COMMAND
PETERSON AIR FORCE BASE, COLORADO 80914

IN REPLY TO ATTN OF: J-TSC 28 April 1981

SUBJECT: STS-1 Report Inputs

TO: J-3TS

1. A post-Shuttle review meeting has revealed that there are several questions regarding SPADATS sensor support of STS-1.

a. Sensors sporadically exceeded HQ NORAD tasking instructions. The following messages specifically requested that sensors do not exceed the levied tasking; HQ NORAD/J-3TIE DTG 11/2345Z Apr 81, HQ NORAD/J-3Z DTG 08/1300Z Apr 81, HQ SAC/XYN DTG 07/2000Z Apr 81. NORAD tasking was 2H (three data points on all passes) for Ascension and Antigua; and 2D (three data points on all passes) for Otis, Beale, and Eglin.

(1) 20MWS exceeded tasking on three out of four passes, twice by as much as 18 observations. The FPS-85 provided 21 obs on a pass for which SCC requested only 12-15 obs.

(2) Otis exceeded tasking on five out of ten passes.

(a) Twice Otis tracked the Shuttle as a UCT and obtained 30 obs both times.

(b) Three of the times Otis tracked the Shuttle as a known object, tasking was exceeded by at least three observations.

(3) Beale exceeded tasking on four out of 11 passes

(a) Beale tracked the Shuttle as a UCT three times and obtained 14, 17, and 17 obs, respectively.

(b) On one track tagged as a known object, Beale obtained 18 observations.

(4) Antigua exceeded NORAD tasking on three out of nine passes. This is not of major concern since Antigua tasking is ultimately the responsibility of ETR.

(5) N/J-3SC will research the reason why the above sensors exceeded NORAD tasking instructions.

b. Unfamiliarity with a 20MWS procedure which is used during manned space launches resulted in SCC confusion during lift-off. The FPS-85 has routinely restricted radar transmission from T-20 seconds through T+70 seconds. This is an FPS-85 safety precaution

against possible interference with the launch vehicle telemetry during lift-off. This procedure is not a checklist item nor is it included in 20MWS Operating Instructions. 90 seconds of downtime does not degrade the FPS-85 system. Downtime must exceed two minutes to constitute realtime.

(1) The ASCC received approval from Missile Warning at 13/1155Z Apr 81 for 90 seconds of downtime. MW initials are DF or DG.

(2) ASCC informally coordinated this procedure on 10 April 81 over the TTY with the mid shift SCC SSC and XMO on duty.

(3) W/J-3ZC will ensure 20MWS manned launch procedures allow flexibility for Shuttle launches and do not involve unnecessary downtime.

c. PARK PAWS tracked the Shuttle as a UCT.

(1) Otis tracked the Shuttle as a UCT twice. On 104/ 10293 Otis obtained 30 observations, all tagged as UCT 90192 and 90193. The 20th ob was tagged correctly as 12399.

(2) Beale tracked the Shuttle as a UCT three times. In two sets of UCT observations the Shuttle was correctly tagged once. This was the last ob of each set.

(3) W/J-3ZC will research the reasons why the Shuttle was intermittently tracked as a UCT and why some UCT tracks had a correct object number tag.

d. NAVSPASUR observations were not received at the SCC until they were retransmitted via FLASH precedence upon SCC request.

(1) The Shuttle was initially tracked as a UCT. NAVSPASUR did a correlation and manually retagged the obs with 12399 prior to transmission to SCC. The manual retag required a subsequent change to the checksum value. This was not done which resulted in a checksum error. Research into this problem continues.

(2) W/J-3ZC will continue coordination with NAVSPASUR to ensure this problem does not occur.

2. W/J-3ZC is preparing a package to NASA which will include the following:

a. An SCC PASCHED in order that NASA can determine if NORAD sensor radiation may have affected the Shuttle.

b. Radiation analysis done by 20MWS (20MWS message DTG 02/2225Z Apr 81), SAI, and Colorado Springs General Electric on SPADATS radars for NASA consideration to determine which sensors may be utilized during future Shuttle missions.

e. A query regarding the possibility of scheduling tests to measure the effect, if any, of suspect NORAD sensors on a future Shuttle flight.

2. Direct questions to Lt Winkle, Chidlaw extension 6277.

JOAN E. D. ZIMMER, 1Lt, USAF
Space Ops Interface Officer

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